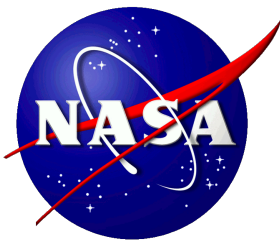


Human Research Program

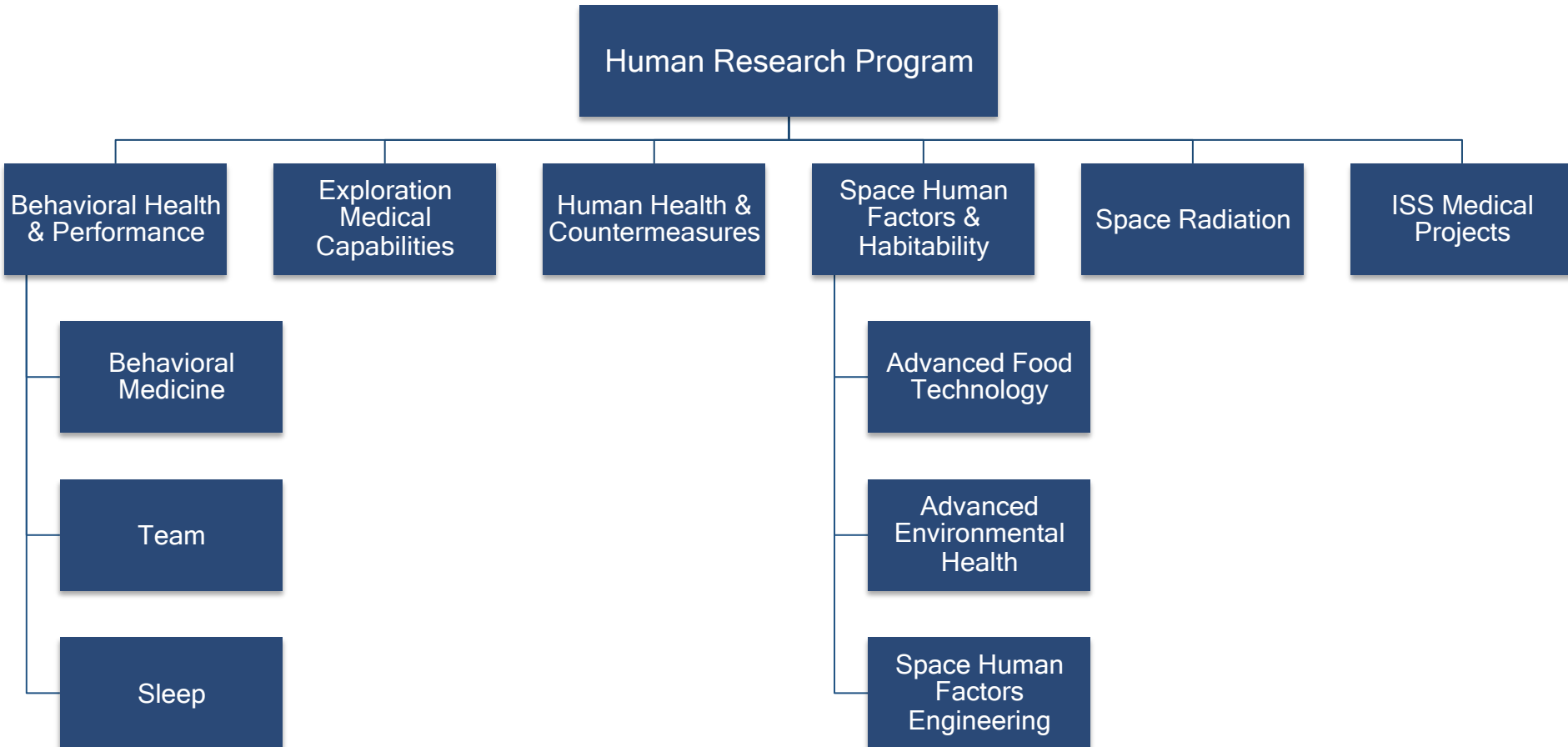
Long Duration, Exploration-Class Mission Training Design



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HRP Elements



TRAIN Risk Gaps Mapped to ADDIE Phases

TRAIN-10: PERFORMANCE SUPPORT TOOLS: We do not have requirements for a performance support tools for LDEM relative to both trainability and autonomous job performance.

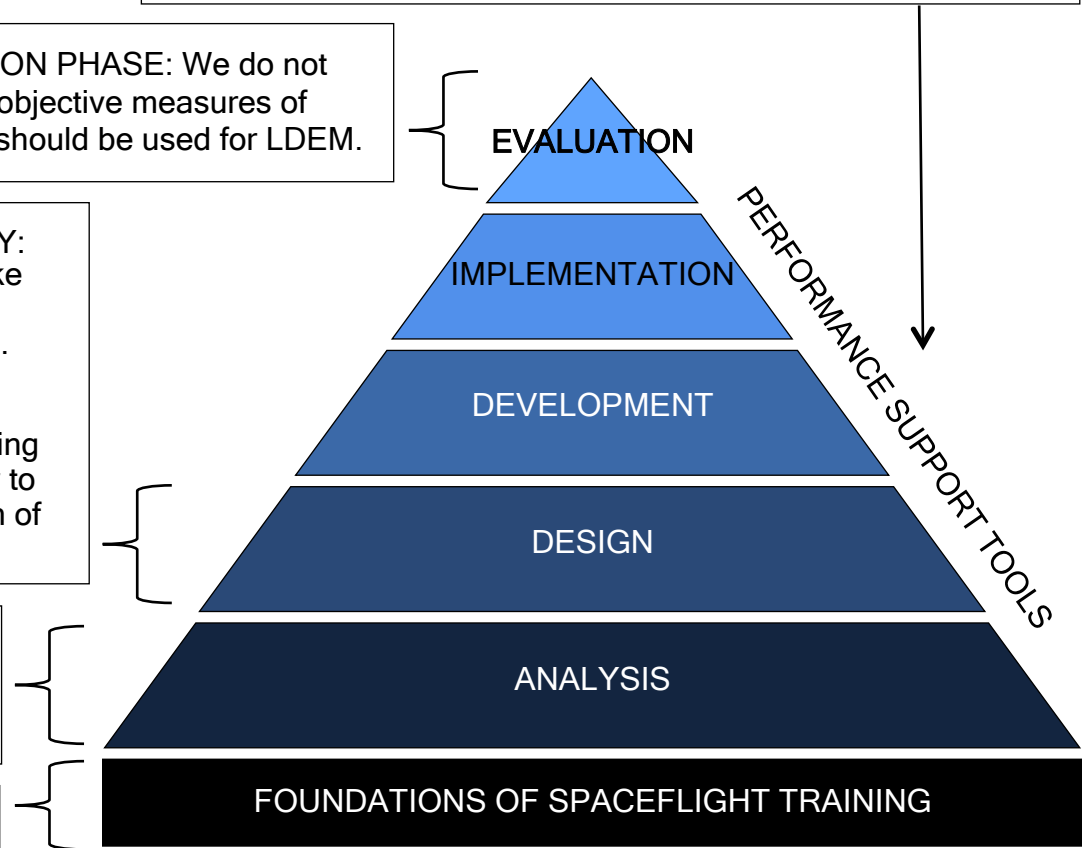
TRAIN-09: EVALUATION PHASE: We do not know which validated objective measures of training effectiveness should be used for LDEM.

TRAIN-08: DESIGN PHASE: METHODOLOGY: We do not know which methods and tools make task and skill acquisition efficient and effective and maximize retention and transfer for LDEM.

TRAIN-07: DESIGN PHASE: FLOW AND MODULES: We do not know to distribute training content across the training continuum nor how to group or sequence content within each section of the training continuum for LDEM training.

TRAIN-06: We do not know how to allocate duties and tasks among crewmembers relative to trainability for autonomous operations for LDEM.

TRAIN-05: We do not have an empirically valid foundation upon which to base the design of spaceflight training to adequately support long duration, exploration-class missions (LDEM).



THE TRAINING CONTINUUM





TRAIN Risk PRR – Gaps and Tasks Redesign

Planetary DRM (Mars)

FY13

FY14

FY15

FY16

FY17

FY18

FY19

FY20

FY21

FY22

FY23

FY24

FY25

FY26

FY27

FY28

ISS 1-Yr Mission

Asteroid Phase A

EM-1

CCP

EM-2

ISS End

Asteroid Initiative

Mars-Phase A

FY15

FY16

FY17

FY18

FY19

FY20

FY21

FY22

FY23

FY24

FY25

FY26

FY27

FY28

Skills Characterized.

Methods and Tools Identified

TRAIN-05 – FOUNDATIONS OF SPACEFLIGHT TRAINING: We do not have an empirically valid foundation upon which to base the design of spaceflight training to adequately support long duration, exploration-class missions (LDEM).

[DRP] Training Retention

Training Retention (Flight Validation)

[NRA] Generalizable Skills

[INT] TW Cog. Perf. In Micro-G

[TBD] Transferability of Skills

[FTE] ISS Best Practices

[FTE] Training Con Ops

[FTE] Cross Cultural Issues

[INT] TW Train Req. & Spec.

[FTE] Simulation Fidelity

[NRA] Simulation Fidelity

TRAIN-06 – ANALYSIS PHASE: We do not know how to allocate duties and tasks among crewmembers relative to trainability for autonomous operations for LDEM.

[FTE] Duty and Task Allocation

TRAIN-07 – DESIGN PHASE: FLOW AND MODULES: We do not know to distribute training content across the training continuum nor how to group or sequence content within each section of the training continuum for LDEM training.

[FTE] Training Content Across Continuum

[FTE] Flow & Modules Across Continuum

TRAIN-08 – DESIGN PHASE: METHODOLOGY: We do not know which methods and tools make task and skill acquisition efficient and effective and maximize retention and transfer for LDEM.

[INT] JITT For Teleoperations

[INT] TW Train Req. & Spec.

[INT] TW M&T Other Domains

[FTE] Training Research Integration

M&T Pre-Flight Initial Training

[INT] TW M&T Aviation

M&T Onboard JIT Training

M&T Pre-Flight Refresher Training

M&T Onboard Initial Training

M&T Onboard Refresher Training

TRAIN-09 - EVALUATION PHASE: We do not know which validated objective measures of operatory proficiency and of training effectiveness should be used for LDEM.

[INT] TW Train Req. & Spec.

[NRA] Training Measures

[INT] TW Train Req. & Spec.

[INT] TW Training Evaluations

[NRA] Training Effectiveness

[NRA] Operator Proficiency

TRAIN-10 - PERFORMANCE SUPPORT TOOLS: We do not have requirements for a performance support tools for LDEM relative to both trainability and autonomous job performance.

[INT] TW Train Req. & Spec.

[INT] TW New Technology Evaluations

[FTE] Data for Autonomous Ops.

[NRA] Performance Support M&T

Backup Slides

Human Research Program Elements

NASA's Human Research Program is responsible for the oversight and coordination of a wide range of ongoing studies, experiments, and projects. HRP research activities are divided among six elements: International Space Station Medical Project, Human Health and Countermeasures, Exploration Medical Capability, Behavioral Health and Performance, Space Human Factors and Habitability, and the Science Management Office.

Behavioral Health and Performance

The Behavioral Health and Performance (BHP) Element conducts and supports research to reduce the risk of behavioral and psychiatric conditions. These include performance decrements due to inadequate cooperation and communication within a team and the risk of errors due to fatigue resulting from sleep loss or work overload.

Exploration Medical Capability

The Exploration Medical Capabilities (ExMC) Element develops medical technologies for in-flight diagnosis and treatment as well as data systems to protect patients' private medical data, aid in the diagnosis of medical conditions, and act as repositories of information about relevant NASA life science experiments.

Human Health Countermeasures

The Human Health Countermeasures (HHC) Element is responsible for understanding the normal physiologic effects of spaceflight and developing countermeasures to those with detrimental effects on human health and performance.

Space Human Factors and Habitability

The Space Human Factors and Habitability (SHFH) Element consists of three main research portfolios: Advanced Environmental Health (AEH), Advanced Food Technology (AFT), and Space Human Factors Engineering (SHFE) that includes human and robotic integration, human computer interactions, vehicle/habitat design, mission planning and task design, and training.

Space Radiation

The goal of the Space Radiation (SR) Element is to ensure that crewmembers can safely live and work in space without exceeding acceptable radiation health risks. Space radiation differs from radiation encountered on Earth.

International Space Station Medical Projects

The International Space Station Medical Projects (ISSMP) Element provides planning, integration, and implementation services for HRP research tasks. The objectives of the ISSMP are to maximize the utilization of the ISS for research to assess the effects of long-duration spaceflight on human systems, to develop and verify strategies to ensure optimal crew performance, and to enable development and validation of an integrated suite of physical, pharmacologic, and nutritional countermeasures to protect the health and performance of crewmembers.

Source: <http://www.nasa.gov/hrp/elements>

BHP Team Skills Training

ASCAN Training

- Some specific BHP and team skills training
- Analogs - NOLS, team events, etc.
- Team skills becoming more prominent with each ASCAN class
 - SFRM
 - Expeditionary Skills

Pre-Assignment Training

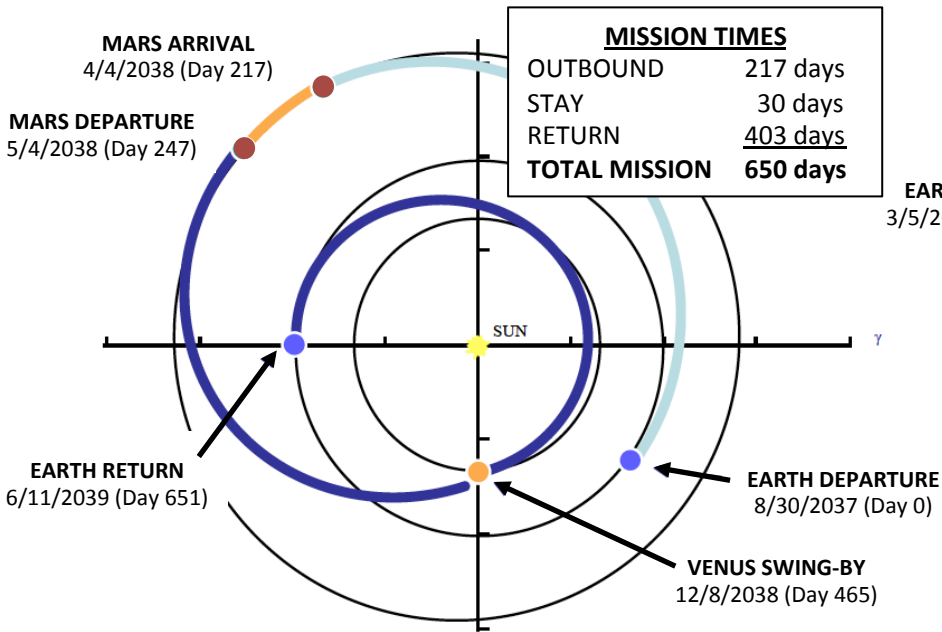
- Refresher Training
- Analogs - NOLS, team events, etc.

Assigned Training

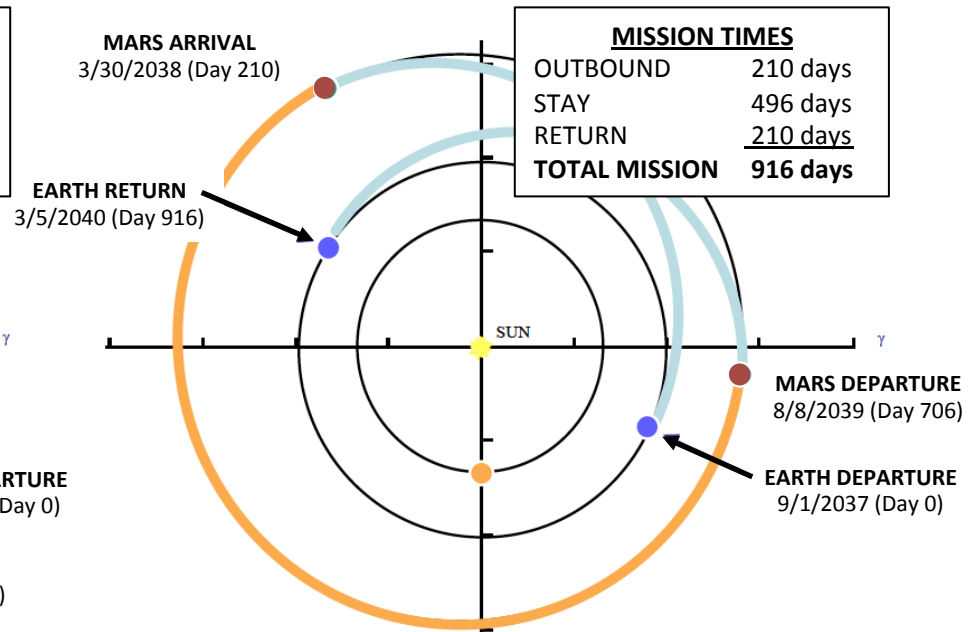
- BHP / Team Skills
 - Psychological support
 - Psychological preparedness
- Analogs - NOLS, team events, etc.
 - *Exploration mission focus of BHP Element emphasizes team skills training with the intact exploration mission crew*

BHP Team Gap5 (Training) supports development and maintenance of team skills with validated training throughout an astronaut's career.

Team skills training complements technical/task training, and follows best practices developed by SHFH TRAIN Risk.



Opposition Class: Short-Stay Mission



Conjunction Class: Long-Stay Mission

Comparison of Opposition class and conjunction class mission profiles.